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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/672,455	09/29/2000	Tetsuya Ishii	30290A	1284

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EXAMINER
CHANG, AUDREY Y

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 12/30/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/672,455	Applicant(s) ISHII, TETSUYA
	Examiner Audrey Y. Chang	Art Unit 2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 October 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *8-34,36-38,40 and 42-51* is/are pending in the application.

4a) Of the above claim(s) *8-34,37,38 and 43-48* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *36,40,43 and 49-51* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on *October 15, 2002* has been entered.

2. This Office Action is also in response to applicant's amendment filed on October 15, 2002, which has been entered as paper number 16.

3. By this amendment, the applicant has amended claims 36, 40 and 42 and has newly added claims 49-51.

4. Claims 8-34, 37-38 and 43-47 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 8.

5. Claims 36, 40, 42 and 49-51 remain pending in this application.

6. The rejection to claims 36, 40 and 42 under 35 USC 112, first paragraph, set forth in the previous Office Action dated April 12, 2002, are **withdrawn** in response to applicant's amendment.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 36, 40 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Sakata (PN. 4,729,640).

Sakata teaches a liquid crystal light modulator device that is comprised of a first transparent substrate layer (3), serves as the *first optical region*, a liquid crystal layer (2), serves as the *second optical region* and a third transparent substrate layer (3) serves as the third *optical region* wherein two relief type triangular *gratings* are formed at the interface between the first and the second optical region and at the interface between the second and the third optical region respectively, (please see Figure 28 B, column 25). The two triangular gratings are essentially *aligned* to each other and have identical depth. The optical path length difference produced by the gratings is of the form $d(n_1 - n_2) + d(n_2 - n_3)$ with d denotes the depth and n_1, n_2 and n_3 denote the index of refraction for the first, second and third optical regions, wherein the term $d(n_1 - n_2)$ is proportional to the phase amplitude of the first diffraction grating and the term $d(n_2 - n_3)$ is proportional to the phase amplitude of the second diffraction grating. This suggests the phase amplitude of the diffractive light modulator device is the sum of the phase amplitudes of the first and the second diffraction gratings. In Figure 15, Sakata teaches that the substrate layer (3) and the liquid crystal layer (2) have different *dispersion* property over the wavelength range interested which means that the index of refraction for both materials are *function* of *wavelength* and the phase amplitude therefore is also a *function of wavelength*. Based on the diffraction theory, it is implicitly true that at least one peak of the phase amplitude that representing the maximum diffraction efficiency (i.e. constructive interference) of the diffractive device is included in the wavelength range of interested.

With regard to the feature concerning the thickness of the grating, this reference does not teach explicitly that the gratings satisfy the cited condition for being a *thin grating*. However this condition is commonly known in the art for designing and identifying a thin grating. It would therefore have been obvious to one skilled in the art to design the gratings to satisfy the criterion for the purpose of producing a thin grating structure.

With regard to the feature concerning the wavelength range, Sakata teaches that the diffractive modulation device with grating structure is operable within visible wavelength range between 400 nm to 700 nm. The middle wavelength within the range is 550 nm. The difference between the longest and shortest wavelength in the range is 300 nm and it is greater than 0.05 times 550 nm.

9. **Claims 49-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Sakata in view of Applicant admitted prior art.**

Sakata teaches a liquid crystal light modulator device that is comprised of a first transparent substrate layer (3), serves as the *first optical region*, a liquid crystal layer (2), serves as the *second optical region* and a third transparent substrate layer (3) serves as the third *optical region* wherein two relief type triangular *gratings* are formed at the interface between the first and the second optical region and at the interface between the second and the third optical region respectively, (please see Figure 28 B, column 25). The two triangular gratings are essentially *aligned* to each other and have identical depth. The optical path length difference produced by the gratings is of the form $d(n_1 - n_2) + d(n_2 - n_3)$ with d denotes the depth and n_1, n_2 and n_3 denote the index of refraction for the first, second and third optical regions, wherein the term $d(n_1 - n_2)$ is proportional to the phase amplitude of the first diffraction grating and the term $d(n_2 - n_3)$ is proportional to the phase amplitude of the second diffraction grating. This suggests the phase amplitude of the diffractive light modulator device is the **sum** of the phase amplitudes of the first and the second diffraction gratings. In Figure 15, Sakata teaches that the substrate layer (3) and the liquid crystal layer (2) have different *dispersion* property over the wavelength range interested which means that the index of refraction for both materials are function of wavelength and the phase amplitude therefore is also a *function of wavelength*. Based on the diffraction theory, it is implicitly true that at least one peak of the phase amplitude that representing the maximum diffraction efficiency of the diffractive device is included in the wavelength range of interested.

The Sakata reference has met all the limitations of the claims with the exception that it does not teach explicitly that the diffraction efficient peak is produced for at least two wavelengths. However for a conventional diffractive optical element, *as disclosed by the applicant* (specification pages 31-32), the diffraction efficiency may be optimized for an arbitrary wavelength and the variation of the diffraction efficiency is neglected within a width of 5% of the wavelength. That is to say the maximum or peak value of the diffraction efficiency may be produced for a wavelength range of $(1+/- 0.05)\lambda$ with λ being the design wavelength for the maximum diffraction efficiency. This range certainly includes at least two wavelengths.

With regard to the feature concerning the thickness of the grating, this reference does not teach explicitly that the gratings satisfy the cited condition for being a *thin grating*. However this condition is commonly known in the art for designing and identifying a thin grating. It would have been obvious to one skilled in the art to design the gratings to satisfy the criterion for the purpose of producing a thin grating structure as desired.

With regard to the feature concerning the wavelength range, Sakata teaches that the diffractive modulation device with grating structure is operable within visible wavelength range between 400 nm to 700 nm. The middle wavelength within the range is 550 nm. The difference between the longest and shortest wavelength in the range is 300 nm and it is greater than 0.05 times 550 nm.

Response to Arguments

10. Applicant's arguments filed October 15, 2002 have been fully considered but they are not persuasive. The newly added claims have been fully addressed and they are rejected for the reasons stated above.

11. In response to applicant's arguments which state that the cited Sakata reference does not teach that the phase amplitude of the diffractive modulator is the sum of the phase amplitudes of the two

diffraction gratings, the Examiner respectfully disagrees and wishes to direct the applicant to a standard textbook for Optics. It is the basic theory of diffraction that the total phase modulation of the diffraction gratings is the sum of the individual phase modulation of the individual diffraction grating.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 703-305-6208. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cassandra Spyrou can be reached on 703-308-1637. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Audrey Y. Chang
Primary Examiner
Art Unit 2872

A. Chang, Ph.D.
December 26, 2002